is done in placing a call using conventional telephone company services. Furthermore, the embodiments of the automatic calling system set forth herein are highly flexible in that they permit a subscriber adopting such systems to subscribe to a plurality of subscriber leased line systems, or the like, and additionally define different billing codes for each telephone number outpulsed as well as for different users of such systems so that billing costs may be allocated, if desired, among different departments of a user's organization. The flexibility of the automatic calling systems, according to the instant invention, are also enhanced due to the fact that the same are programmable on-site without the use of any specialized equipment, and hence, both the telephone numbers which are automatically outpulsed, the acknowledgement tones to be received, and the billing codes automatically output, are readily changeable at the user's site to facilitate changes in subscriber services which may be periodically selected, as well as subsequent refinements in billing code allocations among departments, to accommodate traffic patterns which arise with subsequent use.

The automatic calling system, according to the instant invention, is also highly advantageous in that while the same is entirely processor controlled, outpulsing functions are implemented by hardware on an interrupt basis so that the processor is free to perform other functions on a time-shared basis. Additionally, the automatic calling system, according to the instant invention, displays improved off hook detection and billing code information outpulsing characteristics so as to render the same wholly compatible with varying forms of telephone equipment as may be found in different locations or as a normal function of varying telephone systems. Various requirements, encountered among different subscriber systems located at different distances from a subscriber site, may also be readily accommodated. Furthermore, when embodiments of the instant invention are configured so as to employ muting, a further enhancement of operating characteristics is obtained as uniform system impedance, and response time to service requests is achieved.

Although the present invention has been disclosed in conjunction with rather specific embodiments thereof, various alternatives and modifications to the specific structure and modes of operation, as set forth herein, will be obvious to those of ordinary skill in the art. For instance, numerous modifications and variations in the specific structure, as well as the logic and programming techniques employed, will occur to those of ordinary skill in the art both from the standpoint of designing specific systems for specific applications, as well as utilizing cost effective approaches to the design of systems of varying sizes. Similarly, varying program techniques and modes of operation may be substituted for those disclosed heerein for purposes of achieving design preferences of both the manufacturer and the user, as well as specifically tailoring the operational characteristics of the system to specific requirements. Additionally, in connection with the structure set forth, it will be appreciated that while specific reference has been made to certain off-the-shelf items for purposes of acquainting a reader with specific device information suitable for implementing a preferred embodiment of the instant invention, marked variations in the nature of the components designated may be made to suit the preferences of the designer, or more importantly, to accommodate use of new or varied devices which become available and are preferred due to their improved functional and/or cost characteristics.

Those of ordinary skill in the art will also appreciate that while an embodiment of the invention disclosed herein has been described in association with an eight-channel system, greater or fewer channels may be accommodated without deviating from the concepts of the invention which have been set forth. Similarly, through the selection of microprocessor or microcomputer apparatus having greater capability than that selected for purposes of discussion herein, systems which provide greater flexibility in terms of the number of telephone numbers automatically outpulsed, the number of billing codes which may be assigned and automatically outpulsed, or the speed with which lines requesting service are answered, may be readily enhanced. Furthermore, to this end, it will be appreciated that if it were desired to accommodate a substantially larger number of channels than are discussed herein, it would be entirely practical to add additional DTMF generator means so that, in effect, outpulsing may occur on more than one active channel at a given time. Undoubtedly, many other variations and adaptations of the instant invention will occur to a reader, especially under such circumstances as occur when specific applications are considered or the constraints imposed by differing design objectives are reviewed.

While the invention has been described in connection with several exemplary embodiments thereof, it will be understood that many modifications will be readily apparent to those of ordinary skill in the art; and that this application is to cover any adaptations or variations thereof. Therefore, it is manifestly intended that this invention be only limited by the claims and the equivalents thereof.

What I claimed is:

1. An improved automatic calling system for selectively outpulsing DTMF tone pairs on any of a plurality of channels in response to a service request signal received from a channel requiring service, said automatic calling system including processor means, tone generator means, and means for selectively interconnecting said processor means and said tone generator means to any of said pluraliity of channels to permit a determination of an off hook condition on any of said plurality of channels and an exchange of tone information, the improvement comprising:

means interconnected to said processor means for providing an output signal thereto indicating a programming operation is about to be initiated;

means in said processor means responsive to said output signal indicating a programming operation is about to be initiated for determining if one of said plurality of channels has been placed in an off hook condition and has applied a predetermined DTMF row or column tone to said processor means; and

means in said processor means responsive to a detection of said one of said plurality of channels being placed in an off hook condition and supplying a single predetermined DTMF row or column tone to said processor means for receiving DTMF tone pairs in sequence from said one of said plurality of channels and storing information corresponding to DTMF tone pairs received as digits of a number sequence to be subsequently outpulsed in response to a service request from any of said plurality of channels.